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# Multimodal Machine Learning for Image Based Clinical Diagnostics in Biomedicine

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**Abstract:** *The tremendous evolvement in AI and ML has started to revolutionize clinical biomedicine by enhancing diagnostic precision and decision-making. This paper proposes a multimodal machine learning framework for image- based clinical diagnosis, integrating multiple biomedical data sources such as medical imaging, clinical records, and laboratory parameters. Image features are extracted using deep learning architectures like Convolutional Neural Networks while clinical and numerical data are processed through natural language processing and statistical models. Fusion of these heterogeneous modalities helps develop a better understanding of patient health conditions. Experimental evaluations demonstrate that multimodal integration significantly improves diagnostic performance compared to unimodal approaches, providing higher accuracy and robustness. The proposed model hence points to the potential of AI-driven multimodal systems for assisting clinicians in early disease detection, reducing diagnostic errors, and supporting precision medicine applications in modern healthcare.*

**Keywords**: Patient engagement, data analytics, medical imaging, Artificial Intelligence (AI), healthcare informatics, natural language processing (NLP), medical report summarization, health chatbot, multimodal AI, clinical data visualization, Google Gemini API, Streamlit, machine learning, clinical decision support


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